AP2 Line & Debuncher Studies Status

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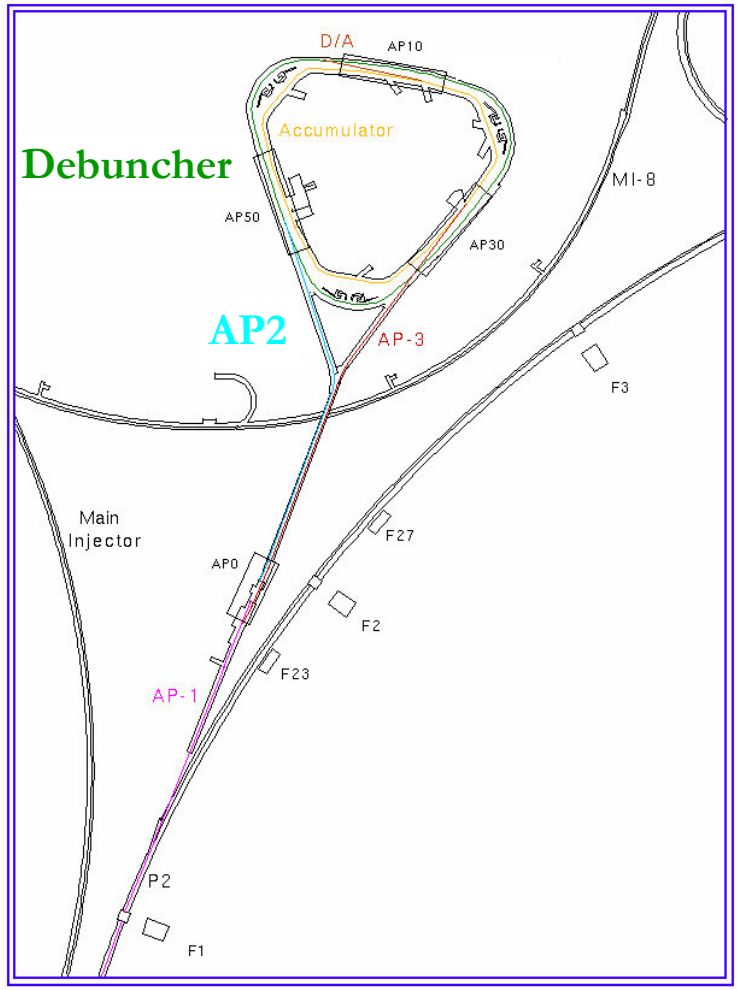
Antiproton Source
January 9, 2006

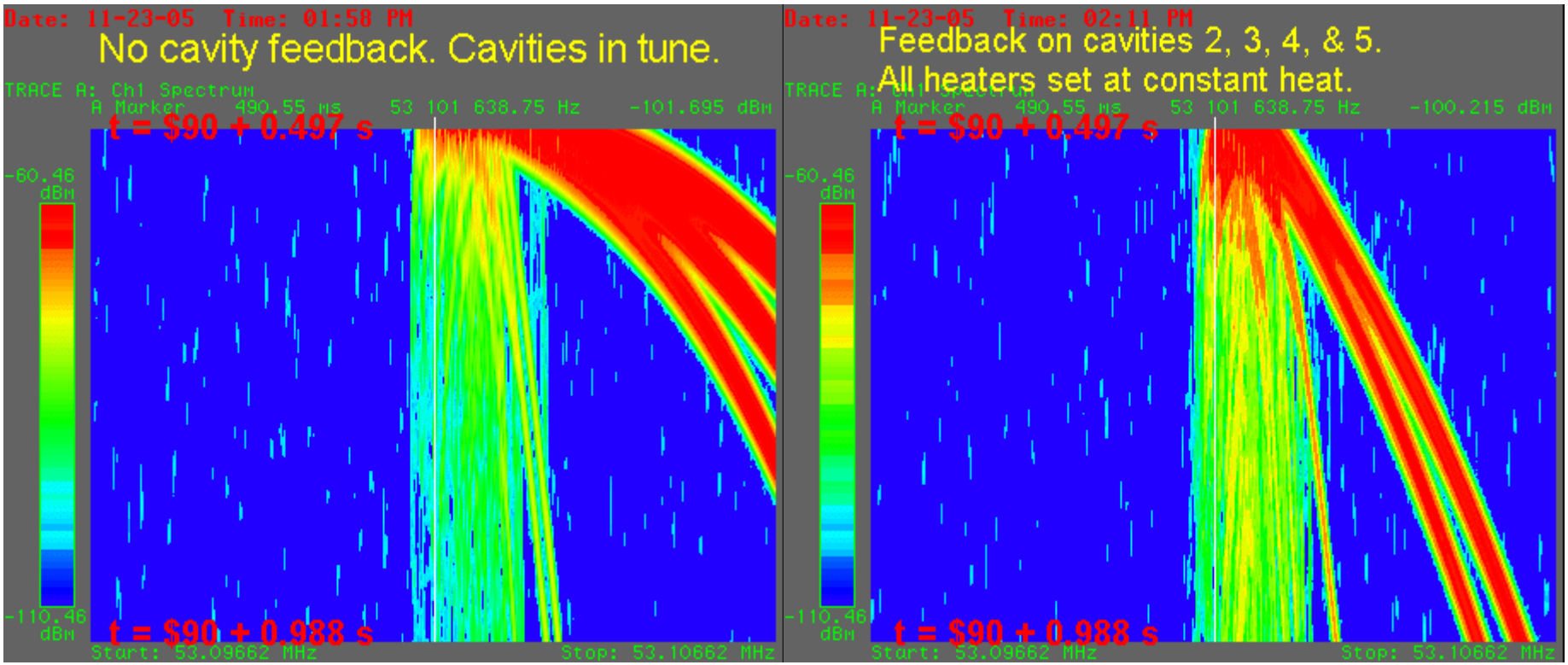


Many people involved with providing the hardware and software that was commissioned as well as performing the beam studies

Story Starts Seven Weeks Ago…

- McGinnis at the All Experimenters' Meeting was describing a two week block of pbar studies
- TeVatron breaks
- Scramble to find people for Thanksgiving weekend studies
- Finished preparatory studies
- Started on the designed study plan
- Owl shifts: started studies for the Debuncher to Accumulator (D/A) transfers

One of the several preparatory items that was done before Thanksgiving

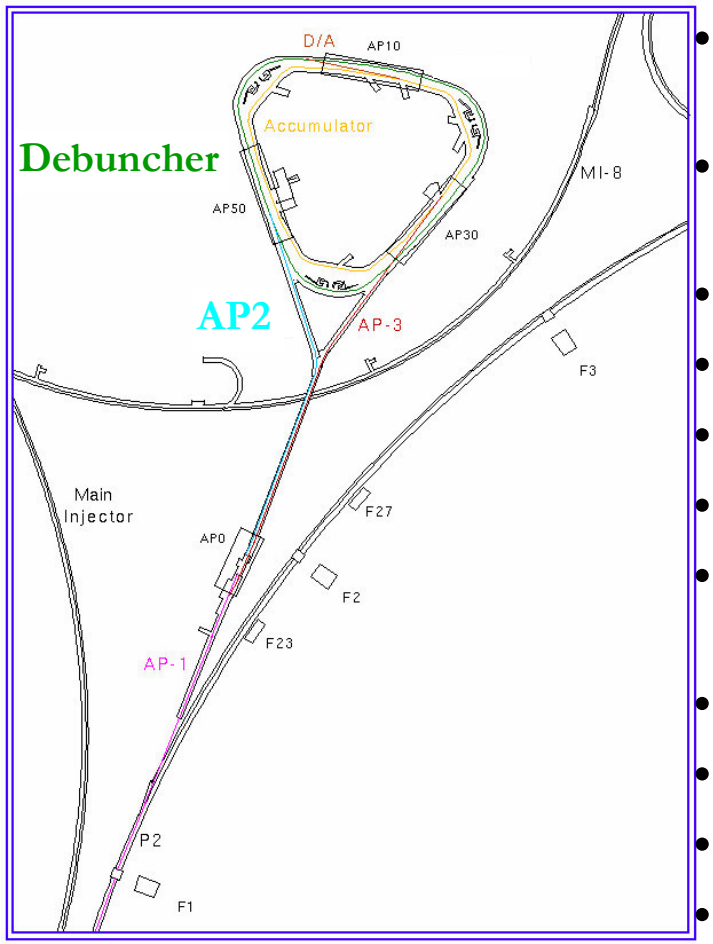


Attempt to remove RF cavities effect on reverse proton injection

Statistics

- Length of Time: **Tue Nov 22 to Thu Dec 15**
- Number of Elog shift pages: **72**
- Number of Recorded Debuncher Orbits: **857**
- Number of Recorded AP2 Orbits: **775**
- Number of Commissioned items: **11**
- Number of Major Accomplishments: **6+½ +½**
- Number of Confusions (at the time): ∞
- Number of Other Things Done: **6+1**
- Number of “Next Times” Known Items: **9**

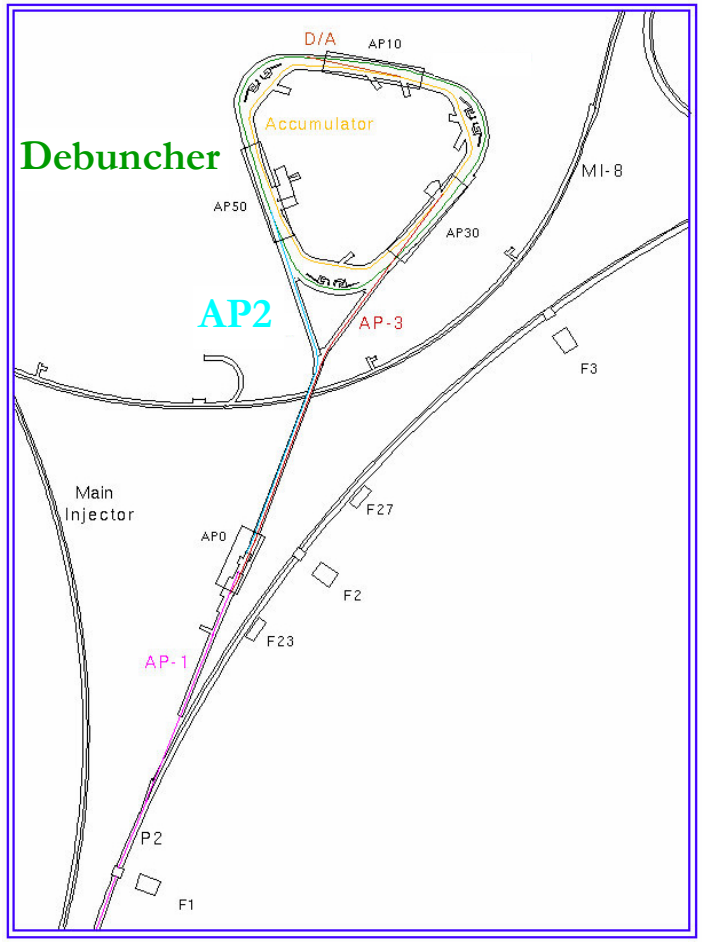
Commissioned Items



- Debuncher Reverse Proton Turn-By-Turn system
- Debuncher Reverse Proton partial turn extraction up AP2
- Debuncher Component Centering
- Debuncher Orbit-Quad offset
- AP2 Orbit-Quad offset
- AP2 Beam Line Correction
- One-Shot Time-line for acquiring Debuncher beam
- Admittance measurement from data-logger
- “Deb Heat Rev p’s to AP2” aggregate
- AP2-Debuncher Injection region setup
- Auto-tune 120 GeV orbit of P1-P2-AP1

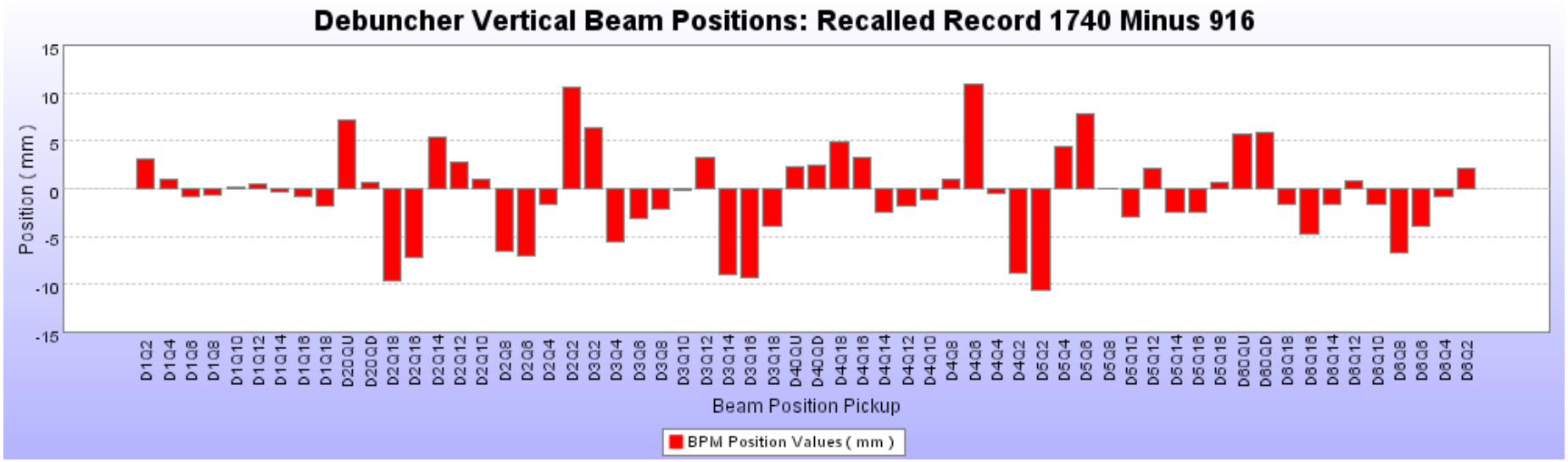
Scheduled Studies Accomplishments

- Lattice measurements for Debuncher and AP2
- Determine Debuncher Orbit/BPM-Quad offsets
- Corrected Debuncher Vertical Orbit to Quad Centers
- Centered Debuncher Components about orbit
- Determine AP2 Orbit/BPM-Quad offsets
- Set Orbit, Stands and Settings for AP2-Debuncher Injection Region
- Corrected AP2 Orbit to near Quad Centers
- Installed AP2 lattice that matches to current Debuncher Lattice



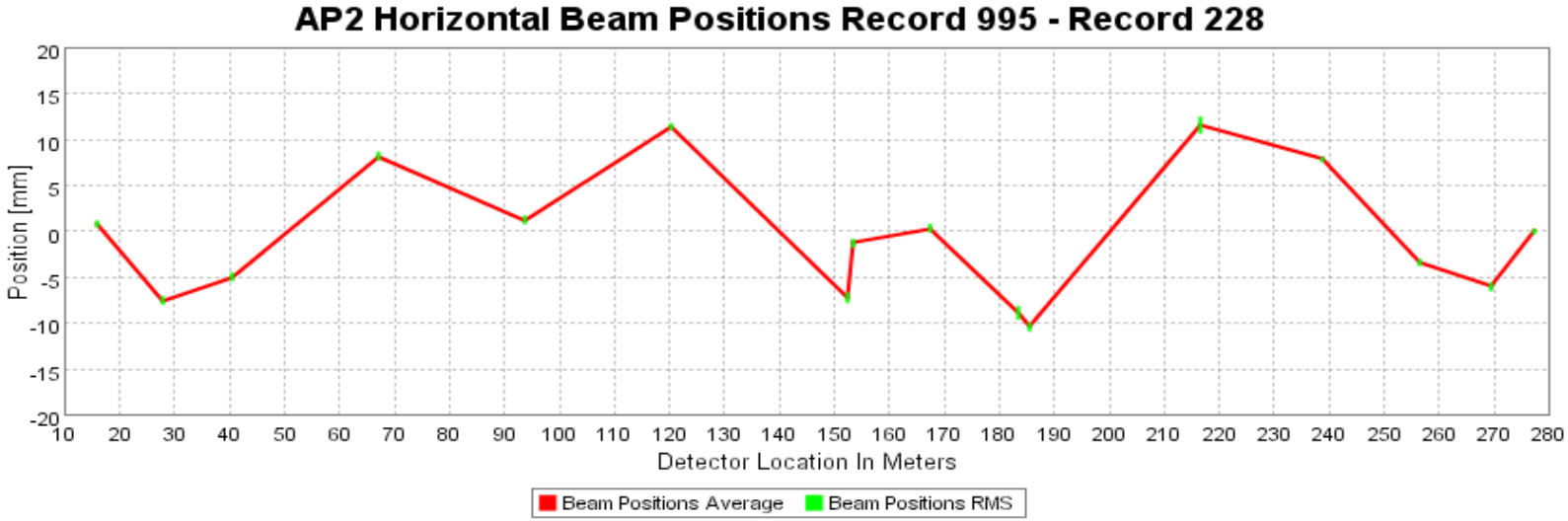
Items ½ completed

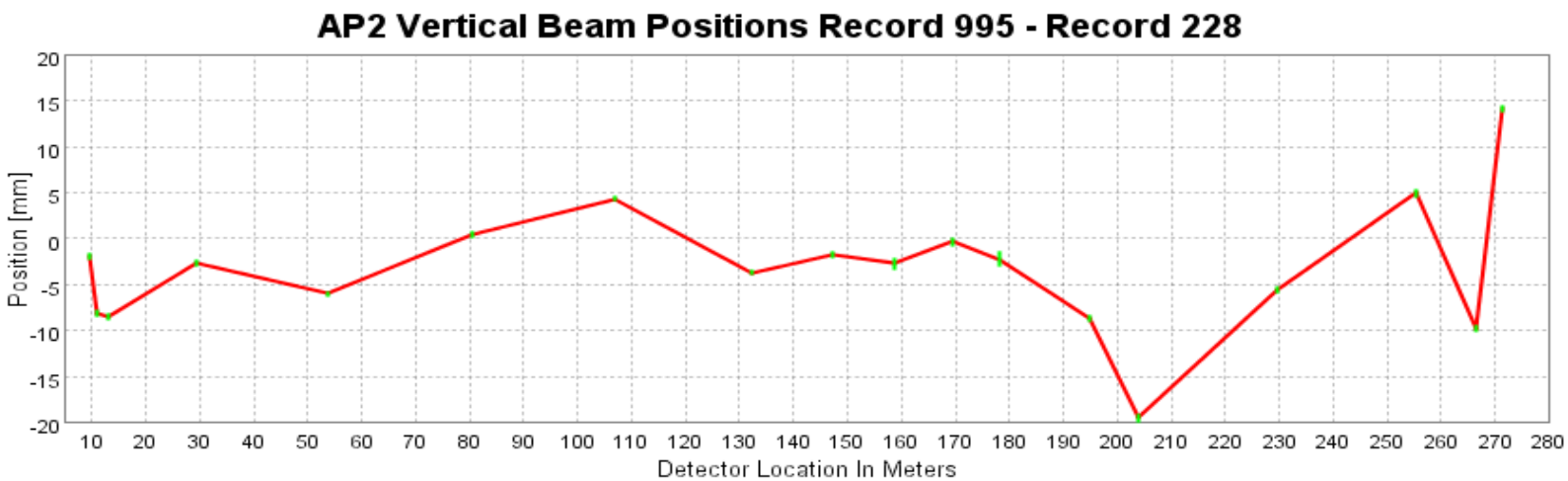
Change in Debuncher Vertical Orbit



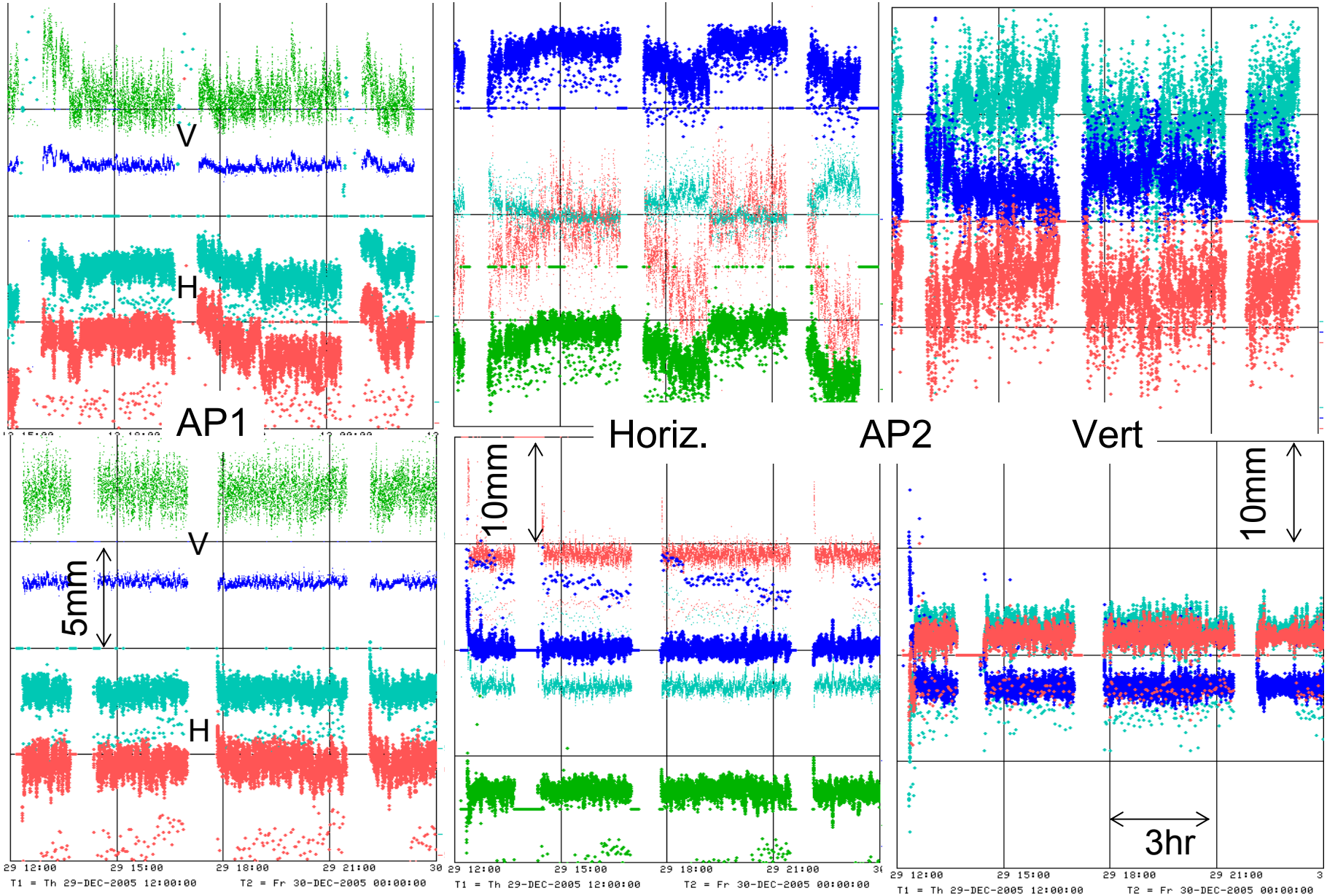
- Steered to center of quads
- Center components about orbit using motorized stands

Change in AP2 Stacking Orbit



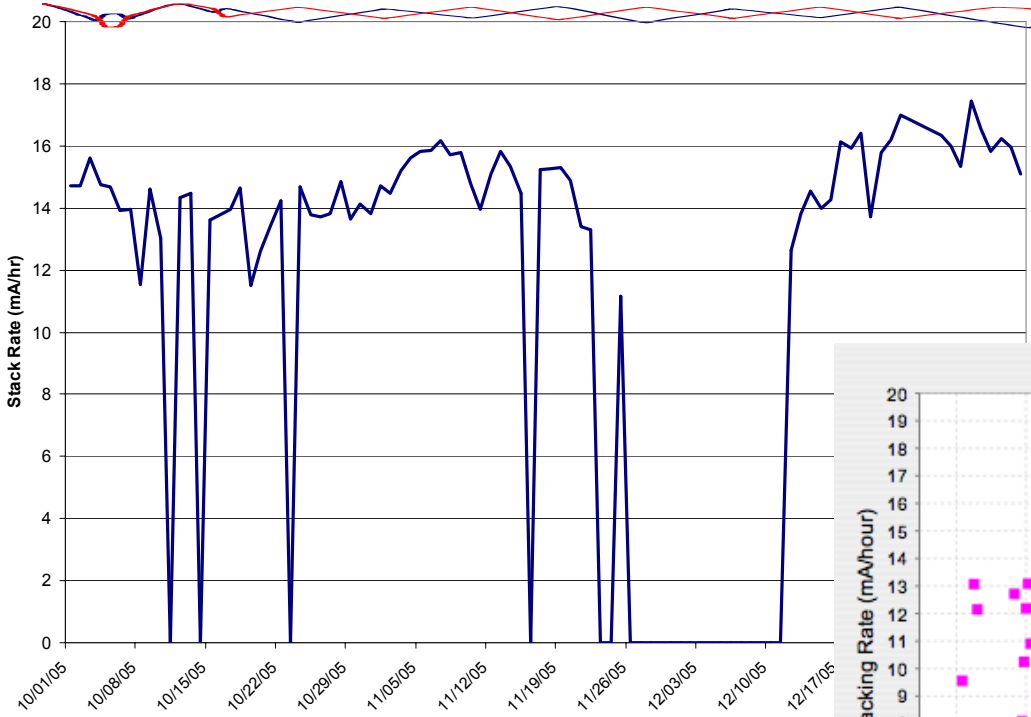


Top - November BPM Positions – NO orbit correction & drifting



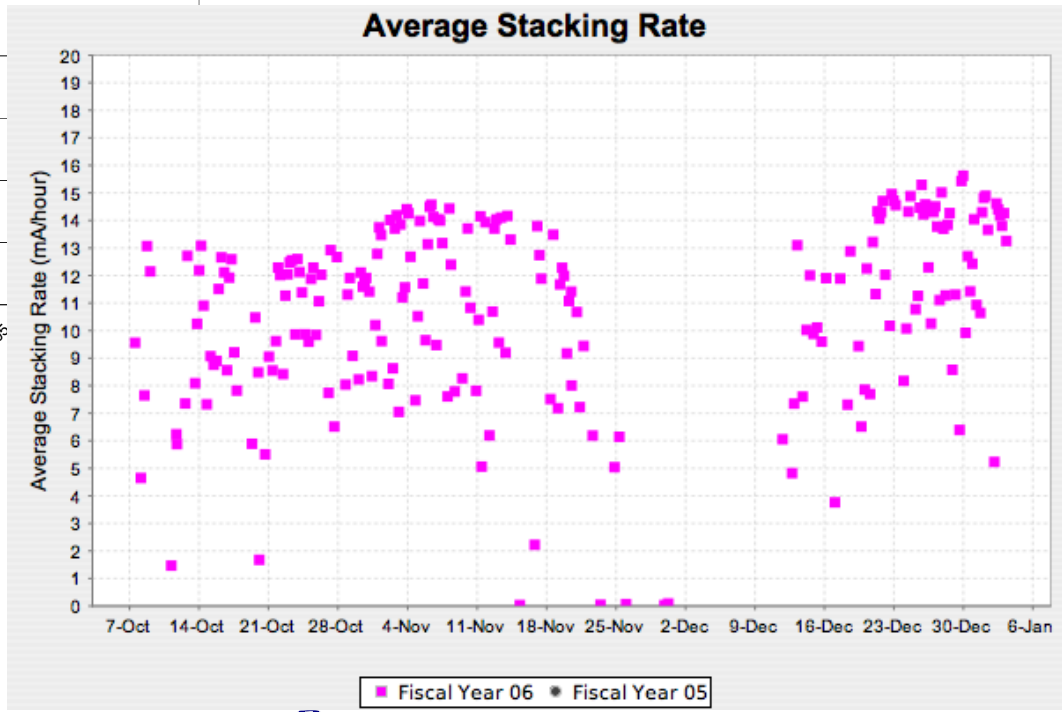
Bottom – December BPM Positions – Orbit Auto-Correction active

Stacking Rate is Better



Best stacking hour for each day

Average stacking rate per stacking cycle (includes effects of complex downtime)



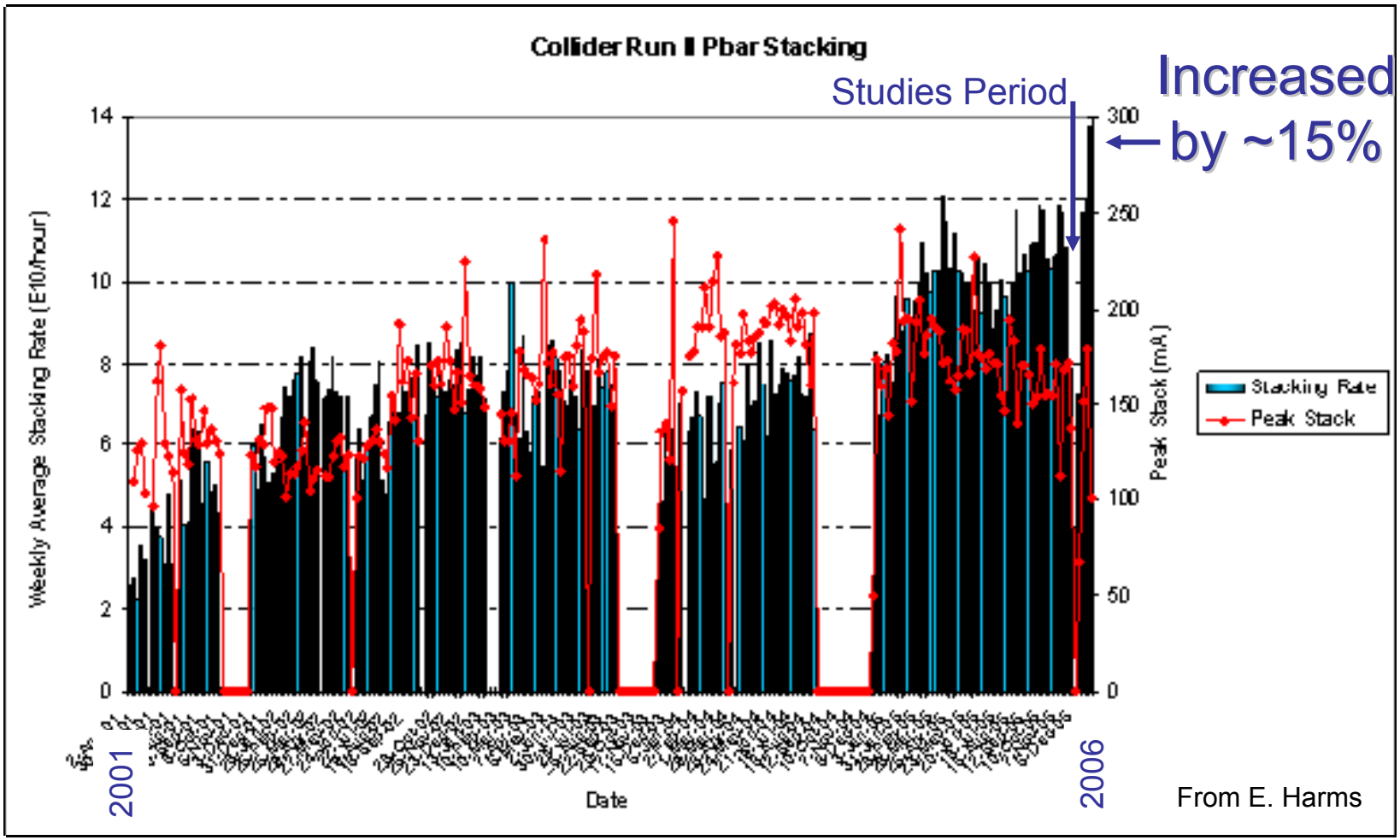
Stacking record

17.46mA/hr

(Dec 29, 2005)

Compiled by P.Derwent

Weekly Statistics

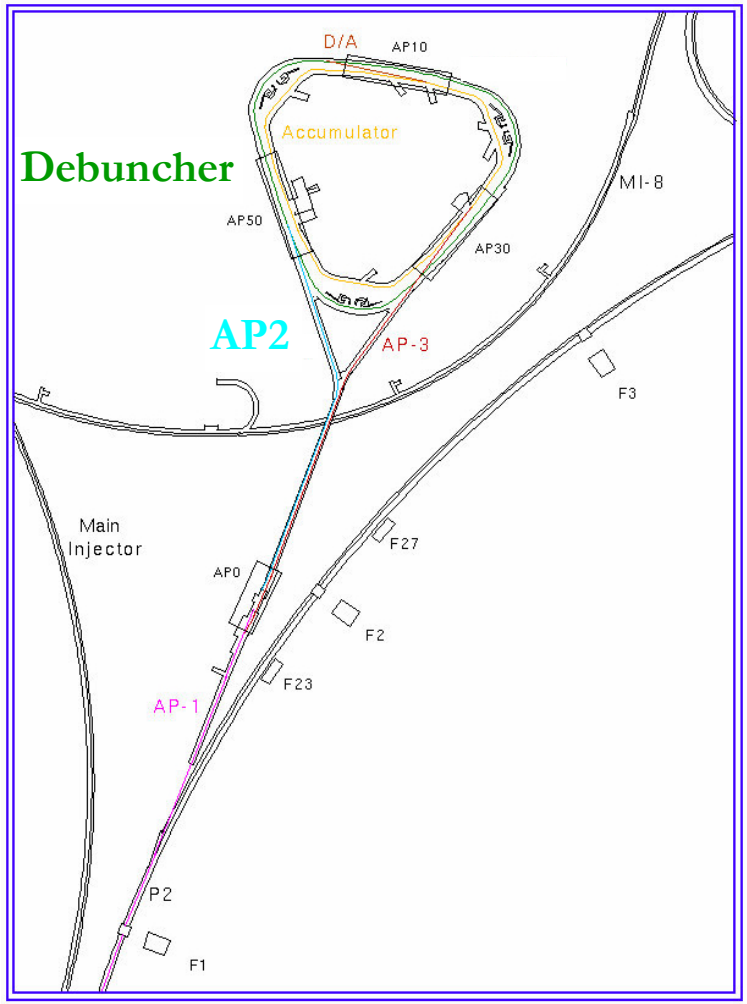


Other Items Done

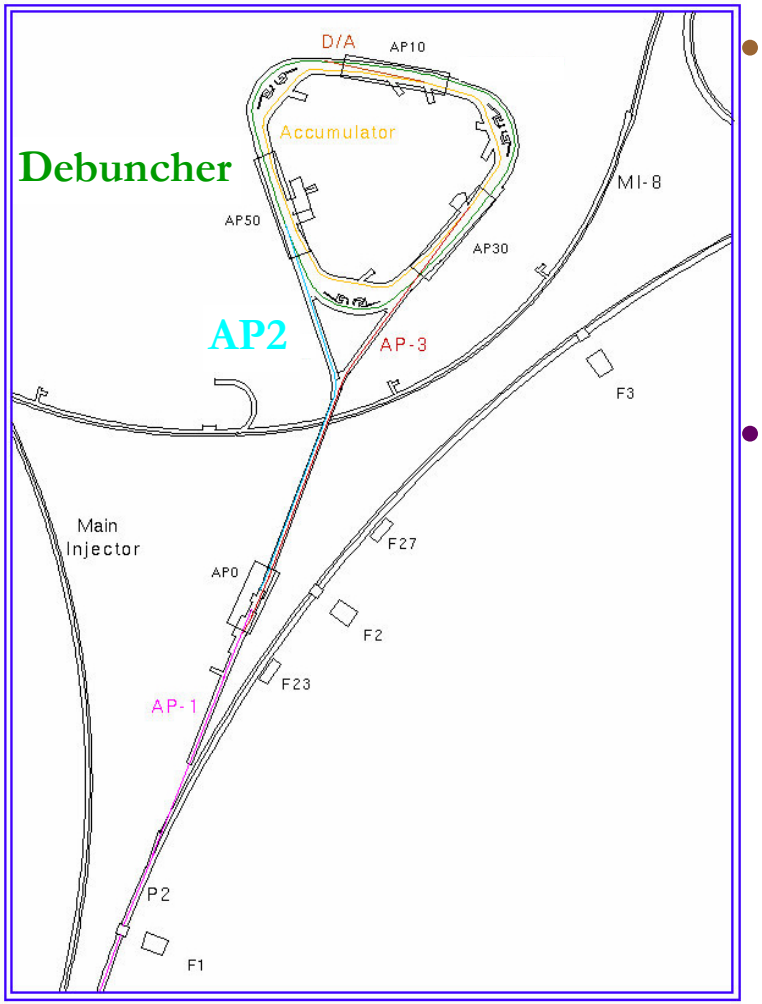
- Replaced failed Li Lens
- Installed Collimator in Target Station
- Survey of AP2-Debuncher Injection Region
- Commissioned Ramped Devices in AP1
- D/A Beam Based Alignment
- Accumulator aperture: Injection channel & orbit
- Stacking tune-up

Next Steps

- Investigate AP2 lattice
- Correct Debuncher Horizontal Orbit
- Center Debuncher Components
- Install new Debuncher Lattice
- Install matched AP2 Lattice
- Remove Lens Steering
- Steer AP2 on apertures
- D/A Orbit
- Accumulator Orbit and Aperture



New Shutdown Items



- Identified Debuncher limiting aperture to be the Transverse Schottky's
  - New larger aperture pickups to be installed
- Identified the need for four dipole trims in the AP2 beam line
  - Two vertical trims to set position and angle going into the AP2 bend
  - One trim in each plane to set position and angle prior to AP2 downward bend to Debuncher

Summary-1

- AP2
  - Defined a better orbit based on quad centers
  - Installed matched lattice to Debuncher
  - Identified vertical scraping in main AP2 bend region
  - Set Injection Region orbit and motorized stand positions
  - Need to work on
    - Center orbit vertically in main AP2 bend region
    - Upstream orbit
    - Lattice
- Debuncher
  - Defined the vertical orbit based on quad centers
  - Centered components on motorized stands about orbit
  - Identified next limiting aperture to be transverse Schottkys
  - Need to work on
    - Center orbit horizontally on quad centers
    - Center components on motorized stands about orbit
    - Lattice work to help beam size in tight apertures
- Antiproton Accumulation has increased by 15%

Summary-2

- D/A and Accumulator Injection Orbit
  - Next stacking limitation
    - D/A orbit needs to be centered in quads
    - Measured Accumulator admittances are <75% of what were measured at the beginning of Run II
- Lessons Learned from 3 Weeks of Studies
  - Configuration control
  - Focus
  - Feedback of the effect of any one change on performance
- Applying the Lessons Learned
  - Break into 1 to 2 day study periods
    - Will request 3 or 4 such periods before the long shutdown